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**ABSTRACT**

of the dissertation for the degree of Doctor of Philosophy

**CURRENT STATE AND DYNAMICS OF THE  
FLORA OF THE ABSHERON PENINSULA**

Speciality: 2417.01 – Botany

Field of science: Biological sciences

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**Baku – 2024**

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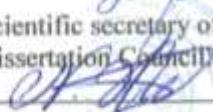
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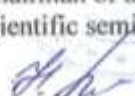
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## INTRODUCTION

**Relevance and degree development of the topic.** The study of flora, its composition, and dynamics is the basis for solving many theoretical and practical issues in taxonomy, botanical geography, resource science, conservation biology, as well as for elucidating the history of flora and predicting its further changes<sup>1,2</sup>.

Currently, flora is significantly impacted by anthropogenic factors, resulting in a weakening of many native species, while the introduction of adventive species occurs. In this regard, the study of regional floras, whose compositions has not yet been studied in sufficient detail, is of particular importance.

One of the most interesting floristically areas is undoubtedly the Caucasus. Despite the extensive literature on the flora and vegetation of the Caucasus, there remain clearly insufficiently studied areas. On the territory of Azerbaijan, the Absheron Peninsula can serve as an example. Although this territory has long attracted the attention of botanists<sup>3,4</sup>.

Floristic research is a necessary basis for developing recommendations for the protection of natural flora, compiling lists of rare and endangered plant species, and for searching for preserved areas of vegetation that need protection to include them in the system of protected natural sites in the Absheron territory. In addition, along with native species, alien and adventive species play an increasingly important role in the flora of the Caucasus (including the flora of Absheron), sometimes introducing themselves into natural biocenoses

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<sup>1</sup> Зернов, А.С. Чеклист флоры Апшерона / А.С.Зернов, Ш.Н.Мирзоева – Баку: CBS Polyg. Produc., – 2021. – 204 с.

<sup>2</sup> Михеев, А.А. Флора Апшеронского полуострова. Материалы по изучению растительных сообществ Азербайджана. / А.А. Михеев – Баку: земотдела Баксовета, – 1926. – 148 с.

<sup>3</sup> Определитель растений Апшерона (Предварительные таблицы) / Коллектив сотрудников ботанических кафедр бакинских вузов: – Баку. – 1931. – 348 с.

<sup>4</sup> Агаджанов, С.Д. Флора и растительность приморских песков Азербайджана и их значение для закрепления и освоения песков: / Авторе канд.биол. наук. / – Баку, 1967. – 32 с.

and displacing local species. Timely recording of the appearance of new species and identifying their contribution to the flora is one of the current tasks of floristics <sup>5</sup>.

A floristic study of the Absheron Peninsula was carried out by P.V. Shvan-Gurisky <sup>6</sup> in “Flora of Absheron and South-East Shirvan Steppe” (1928), and the most complete and detailed information can be found in “Flora of Absheron” (Karyagin, 1952) <sup>7</sup>. However, these works date from 70 years ago.

An exceptionally important aspect is the presence of endemics in the flora of the Absheron Peninsula. A peculiar phytogeographical boundary runs through the peninsula, and a number of endemic species are located here at the extreme limits of their ranges <sup>8</sup>.

Thus, the relevance and timeliness of a complete inventory of the flora is determined by the fact that the territory of the Absheron Peninsula has undergone serious anthropogenic transformation over the last seventy years, and detailed monitoring of the flora has never been carried out. This is connected with large-scale technogenic transformations of ecotopes in the course of oilfield development, with intensive construction of residential neighbourhoods, technical and social infrastructure facilities. Such a load calls into question the existence of many native stenotopic species. At the same time, fundamentally new habitats and conditions for biological invasions and expansions are emerging. All the above-mentioned prompted us to undertake a comprehensive study of the current state of the flora of the Absheron Peninsula.

**Object and subject of research.** The object of the study is the

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<sup>5</sup> Зернов, А.С. О некоторых понятиях флористики / Ред. А.К. Тимонин, «Леонид Васильевич Кудряшов. Ad memorem: Сборник статей», – М.: Макс Пресс, – 2012. – с. 74-87.

<sup>6</sup> Шванн-Гурийский, П.В. Флора Апшерона и Ю.-В. Ширванской степи (краткое пособие по определению растений) / П.В. Шванн-Гурийский. – Баку: АЗГИЗ, – 1928. – 132 с.

<sup>7</sup> Карягин, И.И. Флора Апшерона / И.И. Карягин – Баку: АН Азерб. ССР, – 1952. – 440 с.

<sup>8</sup> Шахсуваров, Р.Т. Псаммофитная растительность прибрежной полосы Каспийского моря (Самур-Дивичинская аллювиально-морская низменность): / Автореф. дис. канд.биол.наук. / – Баку, 1994. – 33 с.

flora of the Absheron Peninsula. The subject of the study is to identifying the current species diversity of vascular plants using classical and modern methods.

**Purpose and objectives of the research.** The aim of this work was to study the current floristic composition of the territory of the Absheron Peninsula and to identify its dynamics. To achieve this goal, the following tasks have been identified:

- ❖ Investigate the flora of the Absheron Peninsula and compile an annotated summary of the flora, including ecological, chorological data and taxonomic comments.
- ❖ Comprehensively analyse the flora (systematic, geographical, ecological) and its dynamics, taking into account the adventive fraction.
- ❖ To study the distribution of species in the study area by habitat type.
- ❖ Identify species and floristic complexes that need protection, and identify areas of the territory with a high content of these species.

**Research methods.** Research was carried out in 2012-2022 in early spring, spring, summer and sometimes autumn using the traditional route method; the most interesting territories were studied in detail and floristic lists were compiled.

The amount of taxa is taken according to the taxonomic views of the authors, nomenclature is given according to the World Flora Online database<sup>9</sup>. The floristic studies determined the taxonomic composition of the flora, recorded species abundance and frequency of occurrence simultaneously with the collection of ecological and phytocenological data. Identification of adventive and native species is based on identifiers.

#### **The main provisions of the defense.**

1. Compiled outline of flora (check-list) of Absheron Peninsula, including 720 taxa of vascular plants (656 of them are native, 64 are adventive), obtained floristic novelties (new species for Caucasus, Azerbaijan, Absheron Peninsula) constitute a

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<sup>9</sup> World Flora Online. An Online Flora of All Known Plants, – 05.01.2024 – [Http://www.worldfloraonline.org](http://www.worldfloraonline.org)

contribution to science.

2. The impact of anthropogenic and natural factors in the study area, including the spread and migration of invasive species, poses a number of threats to the flora of the Absheron Peninsula.
3. The importance of identifying areas with the highest number of protected species and the diversity of floristic complexes on the Absheron Peninsula.

**Scientific novelty of the research.** For the first time, a complete current list of taxa of the flora of the Absheron Peninsula is provided, and its comprehensive analysis is given. Based on these data, the «Конспект флоры Апшерона» has been compiled. For the first time, 3 new alien species for the flora of the Caucasus were discovered in Absheron (*Glebionis coronaria* (L.) Cass. ex Spach., *Solanum elaeagnifolium* Cav. и *Allium neapolitanum* Cirillo.), 3 new species – for the flora of the South Caucasus (*Lepidium didymum* L., *Fumaria capreolata* L. и *Lemna gibba* L.), as well as 4 new species - for the flora of Azerbaijan (*Rumex marschallianus* Rchb., *Cuscuta campestris* Yunck., *Ruta graveolens* L. и *Mentha spicata* L.). New habitats have been identified for 45 species in the Absheron (*Carex divulsa* Stokes., *Geranium albanum* M. Bieb., *Zannichellia pedunculata* Rchb., *Cannabis sativa* L., *Sedum pallidum* M.Bieb., *Orchis simia* Lam., *Rosa canina* L., *Sagina procumbens* L. etc.), and new locations have been established for a number of rare and endemic species. Specific recommendations are given for organizing the protection of flora in the network of proposed floristic reserves.

**Theoretical and practical significance of the research.** The obtained materials can be used in compiling the “Flora of Azerbaijan”, in the system of additional education of schoolchildren, as well as in the compilation of habitat maps and various databases, organizing activities to create a network of new specially protected natural areas, to determining the possibilities of using plants for practical purposes, including reclamation, procurement of raw materials, and adaptive landscape agriculture, etc. Data on rare and endangered species are included in the Red Book of the Republic of Azerbaijan (2023).

**Approbation and application:** Materials related to the dissertation were discussed at a number of international conferences.

These include the following: International scientific conference: “International conference Environmental changes and protection of the diversity of plants” (Baku, 2013); Republican Scientific Conference “Academic science weekly International Multidisciplinary Forum materials” (Baku, 2015); Poster presentation on scientific symposium “State of the World’s Plants Symposium. KEW Royal Botanic” Garden (London, 2017); Republican Scientific Conference “Winter school of young biologists” (Baku, 2019); II Karabakh International Congress "Victory Day and Commemoration of Martyrs" (Shusha, 2021); International Scientific and Practical Conference "Modern Approaches to the study of the Plant Kingdom" dedicated to the Year of Heydar Aliyev (Baku, 2023), International Scientific and Practical Conference “Biomüxtəlifliyin dayanıqlılığının təmin edilməsində yeni çağırışlar (COP29), Yaşıl dünya və insan sağlamlığı” (Nakhchivan, 2024). Results were discussed at the scientific seminar of the Institute of Botany of the Ministry of Education of the Republic of Azerbaijan and are also included in the Red Book of the Republic of Azerbaijan (2023).

Materials of the dissertation work are presented in 18 scientific publications: one monography, 11 articles and 6 theses in peer-reviewed journals, (3 articles in journals indexed in RSCI and WoS, 1–in WoS Core Collection and Scopus).

**Name of the organization where the dissertation work is carried out.** Dissertation work is carried out in the Herbarium Department of the Institute of Botany of the Ministry of Science and Education of the Republic of Azerbaijan.

**The total volume of the dissertation.** The dissertation covers 274 pages, consisting of introduction, 6 chapters, conclusions, reference with 211 titles and addition. The dissertation consist of 172.105 characters: (introduction: 11.767 signs, chapter I- 9.787 signs, chapter II- 20.812 signs, chapter III- 6.837 signs, chapter IV- 55.034 signs, chapter V- 33.831 signs, chapter VI- 30.516 signs, results – 2.308 signs, recommendation – 1.373 signs). The list of literature consist of 211 titles, 40 of them are from Azerbaijan, 138 Russian sources and 33 foreign sources. The dissertation is enriched with 16 tables, 6 schematic maps and figures.

## **MAIN CONTENT OF WORK**

### **CHAPTER I. HISTORY OF RESEARCH ON THE FLORA AND VEGETATION OF THE ABSHERON PENINSULA**

The chapter contains information on the history of the study of flora and vegetation of the Absheron Peninsula. The studies were conducted mainly for the purposes of livestock development, primarily to assess the stock of fodder resources.

### **CHAPTER II. PHYSICO-GEOGRAPHICAL CONDITIONS OF THE ABSHERON PENINSULA**

The chapter briefly characterizes the natural conditions of the Absheron Peninsula: geographical position, relief, soils, water supply and climate <sup>10</sup>.

Geomorphologically, the Absheron Peninsula is a continuation of the south-eastern tip of the Greater Caucasus and is a kind of antipode of the Taman Peninsula <sup>11</sup>. Here, the mountainous relief is degrading and the climate is becoming arid; there are active mud volcanoes erupting liquid clays and oil, and outcrops of various salts formed in semi-desert and dry steppe deposits <sup>12</sup>.

### **CHAPTER III. MATERIALS AND RESEARCH METHODS**

The study of the flora of the Absheron Peninsula was conducted in 2012-2022 in early spring, spring, and summer and sometimes in the autumn season by the classical route method. We adopted the borders of the peninsula as follows: from the north-east, east and south-east the peninsula is framed by the Caspian Sea; the western border is approximately the meridian running along the lower reaches

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<sup>10</sup> Azərbaycanın Milli Atlası. Bakı Kartoqrafiya fabriki, Bakı, 2014. – 444 s.

<sup>11</sup> Благоволин, Н.С. Геоморфология Керченско-Таманской области – М.: Изд-во АН СССР, – 1962. – 192 с.

<sup>12</sup> Hüseynli, N.İ. Abşeron yarımadasının müasir landşaftları və ekoloji problemləri: / coğrafiya üzrə fəlsəfə doktoru dis. / – Bakı, 2008. – 177 s.



of the Sumgayit-Chay River (in the north) to Mount Kergez (in the south), in the south-west the border runs west of the mountains Ag-Burun and Ilkhi-Dagh, including the first foothills of Gobustan.

In order to clarify the list of species and their distribution across the Absheron Peninsula, as well as in connection with the taxonomic aspects of the thesis, the available organizations of the following Herbariums were studied: Herbarium of the Institute of Botany of the Ministry of Science and Education of the Republic of Azerbaijan (BAK), Herbarium of the V.L. Komarov Botanical Institute of the RAS (LE), Herbarium of the N.V. Tsitsin Main Botanical Garden RAS (MHA), D.P. Syreyshchikov Herbarium of the Faculty of Biology, Lomonosov MSU (MW).

We included both adventive species and cultivated species in the anthropogenic component of the flora. Of the latter, only the most common and important in landscaping and agricultural production are considered.

For flowering plants, classes within divisions, families within classes, genera within families, and species within genera are presented in alphabetical order by Latin names. The volume of taxa is taken in accordance with the taxonomic views of the authors, nomenclature is given mainly in accordance with the World Flora Online database (december, 2023) except in cases where it diverges from the taxonomic views of the authors.

In the process of work the generally accepted methods of floristic research were used: visual acquaintance with the selected phytocenosis; laying and description of sample (accounting) sites with registration of floristic composition, abundance, phenological state, vitality and prevalence; geographical analysis<sup>13,14</sup> herbarising and species identification.

For phytocenological and ecological analysis of plants we used

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<sup>13</sup> Гроссгейм, А.А. Флора Кавказа / А.А. Гроссгейм. – Баку: АзФАН, – т. 1-7 – 1939-1967.

<sup>14</sup> Гурбанов, Э.М. Флора и растительность Атропотанской провинции (в пределах Азербайджанской Республики): / *biologiya üzrə doktorluq dis.* / – Баку: Элм, – 2007. – 240 с.

the classification of L.G. Ramensky<sup>15</sup>, A.P. Shennikov<sup>16</sup> and P.D. Yaroshenko<sup>17</sup>, as well as the vegetation map of V.J. Gadzhiev<sup>18</sup> and E.M. Gurbanov<sup>19</sup>.

The abundance of species is given as follows according to the 5-point scale of A.A. Grossheim<sup>20</sup>: by visual inspection, 5 points - 80-100%, 4 points - 70-80%, 3 points - 50-70%, 2 points - 20-50%, 1 point – up to 20%. In defining adventive and native species we relied on the work of A.S. Zernov<sup>21</sup>, and endemic species are defined according to the Red List of the Endemic Plants of the Caucasus<sup>22</sup>.

## CHAPTER IV. ANALYSING THE FLORA OF THE ABSHERON PENINSULA

**Taxonomical analysis.** As it is clear from our defined data, 720 taxa belonging to 396 genera and 85 families inhabit the territory of

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<sup>15</sup> Раменский, Л.Г. Основные закономерности растительного покрова и методы их изучения // – Вестник опытного дела Средне-Чернозёмной области. Воронеж: Областная редакция издательского комитета Народного комиссариата земледелия, – 1924. – с. 37–73.

<sup>16</sup> Шенников, А.Н. Введение и геоботанику / А.Н.Шенников. – Л.: Ленингр. ун-та, – 1964. – 447 с.

<sup>17</sup> Naciyeв, V.C. Azərbaycanın bitki örtüyü xəritəsi [Xəritə] / 1:600000 / – Bakı: Azərbaycan Respublikasının Dövlət Torpaq və Xəritəçəkmə Komitəsi, – 2007.

<sup>18</sup> Ярошенко, П.Д. Геоботаника (Основные понятия, направления и методы) / П.Д. Ярошенко. – М.: Акад. наук СССР. – 1961. – 473 с.

<sup>19</sup> Qurbanov E.M. Azərbaycanın bitki örtüyü xəritəsi / Azərbaycan Respublikası əqli mülkiyyət agentliyi. Əsərin qeydiyyatı haqqında şəhadətnamə. №13555. Bakı: – 2023. – 1 v.

<sup>20</sup> Гроссгейм, А.А. Введение в геоботаническое обследование зимних пастбищ с Азербайджанской ССР / А.А. Гроссгейм. – Баку: Наркомзем, – Серия А. – вып.1. – 1929. – 68 с.

<sup>21</sup> Зернов, А.С. Флора Северо-Западного Кавказа / А.С. Зернов – М.: Товарищество научн. изд. КМК, – 2006. – 664 с.

<sup>22</sup> Ali-zade, V., Hajiev, V., Kerimov, V. Musayev, S, Abdiyeva, R, Farzaliyev, V. Endemic plants of Azerbaijan. In: Red List of the Endemic Plants of the Caucasus. Eds.J.Solomon,T.Shulkina, G.Schatz. USA, Missouri Botanical Garden Press: Saint Louis, – 2014 – p. 67-108.

the Absheron Peninsula<sup>23</sup>. The flora of the Absheron Peninsula constitutes 11.3 % of the flora of the Caucasus<sup>24</sup> (6,350 taxa); 14.4 % of the flora of Azerbaijan<sup>25</sup> (5,000 taxa) and 68.3 % of the flora of the Caspian coast<sup>26</sup> (1,054 taxa).

At present, the dynamics of the flora of the Absheron Peninsula has features characteristic of most native floras. Although the number of species has increased slightly, the main reason for this increase is feralization from cultivated and adventive plants. At the same time, unfortunately, some native species exposed to human impacts are disappearing. The work of studying the flora of the peninsula is not considered complete, as annual field surveys bring new finds<sup>27</sup>.

Comparative analysis of literature<sup>7,28</sup> data from 1952-2012 and our studies conducted in 2012-2022 showed that there was a significant change in the dynamics of the flora. This can be explained by increased urbanization, the departure of introduced species into the wild, the rise and fall of the water of the Caspian Sea (figure 1).

The main proportions of the flora of the Absheron Peninsula are summarized in table 1. In the studied flora, the overwhelming majority are angiosperms, among which dicotyledons significantly prevail.

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<sup>23</sup> Zernov, A.S., Mirzayeva, Sh.N. Plant diversity of Absheron peninsula // Baku: The Institute of Botany ANAS, Plant & Fungal Research, – 2021. №4(1). – p. 35-40.

<sup>24</sup> Əsgərov, A.M. Azərbaycanın bitki aləmi (Ali bitkilər-Embryophyta). – Bakı: TEAS Press Nəşriyyat evi, – 2016, – 444 s.

<sup>25</sup> İbadullayeva, S.J, Huseynova, I.M. An Overview of the Plant Diversity of Azerbaijan. In: Öztürk, M., Altay, V., Efe, R. (eds). Biodiversity, Conservation and Sustainability in Asia. Springer, Cham; 2021. [https://doi.org/10.1007/978-3-030-59928-7\\_17](https://doi.org/10.1007/978-3-030-59928-7_17).

<sup>26</sup> Hüseynova, H.Z. Xəzər sahilinin florası, bitkiliyi və onların səmərəli istifadəsi (Azərbaycan Respublikası ərazisində): / avtoref. dis. biol. elm.dok. / – Bakı: 2024. – 58 c.

<sup>27</sup> Mirzayeva, Sh.N., Zernov, A.S. Dynamics of the flora of the Apsheron peninsula // Materials of International Scientific-Practical Conference "Modern Approaches The Study of The Plant Kingdom" dedicated to the Year of Heydar Aliyev. – Baku: NSE of the RA Institute of Botany, – 2023. – p. 100-101.

<sup>28</sup> Axundova, A.A. Abşeron yarımadasının bitki örtüyünün bioekologiyası, qorunması və bərpa: / biologiya üzrə fəlsəfə doktoru dis. / – Bakı, 2012. – 200 s.

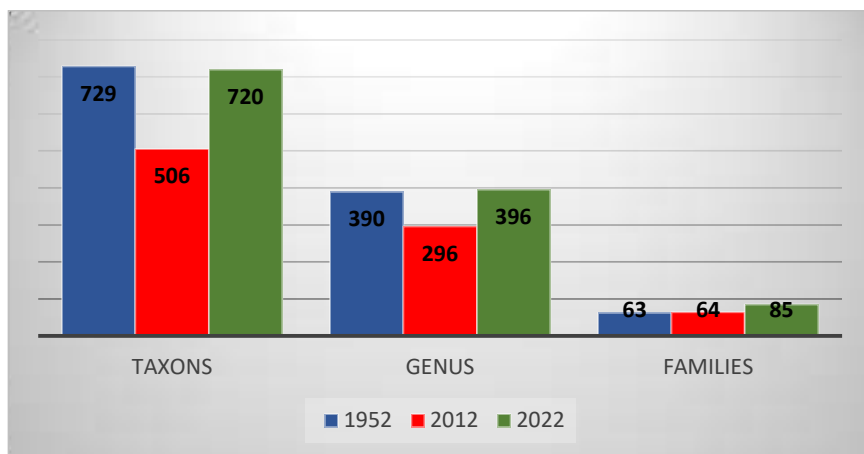


Figure 1. Changes in the dynamics of the flora of the peninsula in 1952-2012-2022.

Table 1

Main proportions of the flora of the Absheron Peninsula

Divisions	Number of taxons	%	Number of generas	%	Number of families	%
<i>Polypodiophyta</i>	5	0,7	5	1,3	3	3,6
<i>Equisetophyta</i>	2	0,3	1	0,3	1	1,2
<i>Pinophyta</i>	5	0,7	4	1	2	2,4
<i>Gnetophyta</i>	2	0,3	1	0,3	1	1,2
<i>Magnoliophyta</i>	706	98	385	97,2	78	93
<b>including:</b>						
<i>Liliopsida</i>	145	20,2	77	19,5	13	15,5
<i>Magnoliopsida</i>	560	77,7	308	77,7	72	84,5
<b>Total:</b>	<b>720</b>	<b>100</b>	<b>396</b>	<b>100</b>	<b>85</b>	<b>100</b>

The largest families with number of taxa more than 25 in the studied flora are 7 (table 2). They contain 209 (53%) genera and 392 (54.5%) taxa.

Table 2

## Leading families of the flora of the Absheron Peninsula

Familia	Number of genera	Participation rate	Number of Taxons	Number of Taxons
1. <i>Poaceae</i> Barnhart	52	13,2%	94	13,1%
2. <i>Asteraceae</i> Giseke	51	12,3%	85	11,7%
3. <i>Fabaceae</i> Juss.	20	5,1%	60	8,4%
4. <i>Chenopodiaceae</i> Vent.	20	5,1%	52	7,2%
5. <i>Brassicaceae</i> Burnett	30	7,6%	46	6,4%
6. <i>Caryophyllaceae</i> Juss.	17	4,3%	30	4,2%
7. <i>Apiaceae</i> Lindl.	19	4,8%	25	3,5%
<b>Total:</b>	<b>209</b>	<b>53%</b>	<b>392</b>	<b>54,5%</b>

The analysis of species richness in genera showed isolation of several groups. There are 13 genera including from 7 to 14 taxa (figure 2).

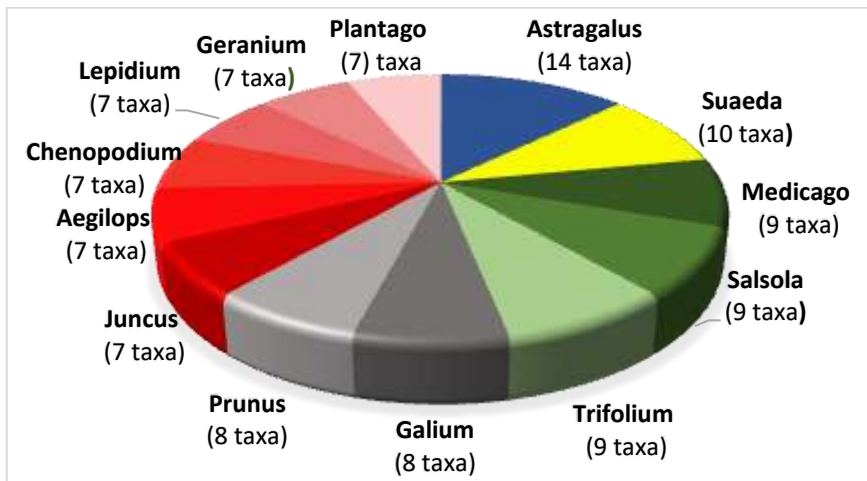


Figure 2. Leading genera of the flora of the Absheron Peninsula

The largest families by the number of single-species genera are arranged in the following sequence: *Asteraceae* Giseke (33 taxa), *Poaceae* Barnhart (31), *Brassicaceae* Burnett (20), *Chenopodiaceae* Vent. (13), *Fabaceae* Juss. (12), *Caryophyllaceae* Juss. (10)<sup>29</sup>.

**Geographical analysis.** For phytogeographical analysis of the flora of the Absheron Peninsula, we identified 23 geographical elements, including 3 cosmopolitan, 64 adventive, 7 with unclear range and 23 cultural species. The analysis showed that the highest number of species is characterized by Xerophilic (Mediterranean and Mediterranean-Iranian-Turanian elements, 112 and 95 taxa, respectively), as well as boreal (European and Palaearctic elements, 88 and 46 species, respectively) and Caucasian (Caucasian element - 65 species) types. Less represented: Holarctic (15) and Atlantic (10) elements of the Boreal type; Turanian (40), Iranian-Turanian (31), Eastern Mediterranean (28), Iranian and Fore-Asian (22 species each) elements of the Xerophilic type, and Eastern Transcaucasian (11) element of the desert type. The lowest number of species was noted for representatives of the ancient (Hyrcanian - 5, Old Mediterranean and Colchian elements - 1 taxa each), steppe types (Pontic and Sarmatian - 5, Caspian - 3, Pannonian-Sarmatian - 2 taxa each), and Caucasian (Iberian element - 4) types (figure 3).

At the same time, fundamentally new habitats and conditions for biological invasions and expansions arise. The flora of any region can be divided into two groups: native, or indigenous plants, and introduced, or adventive species. The appearance of the latter in the flora is associated with economic activities, as a result of which diaspores of alien plants are transmitted to new areas outside their natural range. The status of these new species in the regional flora is diverse: in some areas their proportion is significant and almost comparable to the natural flora<sup>30</sup>.

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<sup>29</sup> Zernov, A.S., Mirzayeva, Sh.N. Life forms and ecological groups of the flora of the Absheron peninsula // Plant & Fungal Research, – v.3. – 2020. №2 (december), – p. 46-51.

<sup>30</sup> Mirzayeva, Sh.N. Additions to the Apsheron Flora // Bulletin of Science and Practice. – v. 8. – 2022. №7, – p. 49–52.

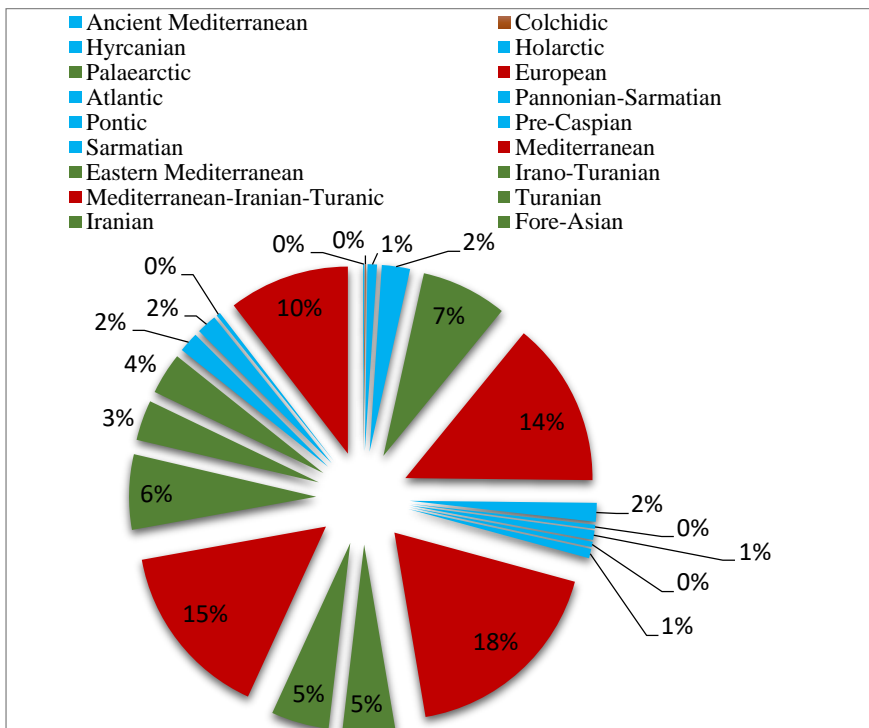


Figure 3. Classification of geographical elements of the flora of the Absheron Peninsula

Out of 64 adventive species, 13 were found for the first time in Absheron: *Lepidium didymum* L., *Fumaria capreolata* L., *Glebinois coronaria* (L.) Cass. ex Spach (figure 4), *Solanum elaeagnifolium* Cav.<sup>31</sup>; (figure 5), *Cardamine hirsuta* L., *Oxalis corniculata* L., *Acalypha australis* L., *Euphorbia maculata* L., *Eclipta prostrata* (L.) L., *Caesalpinia gilliesii* (Hook.) D.Dietr., *Lycium barbarum* L., *Allium neapolitanum* Cirillo<sup>32</sup> (figure 6)

<sup>31</sup> Zernov, A.S., Mirzayeva, Sh.N. *Solanum elaeagnifolium* Cavara, a new invasive species in the Caucasus // Communications from the Kärntner Botanikzentrum Klagenfurt, – Austria: Wulfenia. vol. 23, – 2016. – p. 253-256

<sup>32</sup> Мирзоева, Ш.Н., Зернов, А.С. *Allium neapolitanum* (Amaryllidaceae) – Новый Чужеродный вид для Флоры Кавказа // С.Пт.: Ботанический Журнал, – т. 107. – 2022. № 6, – с. 594–598.

*Datura innoxia* Mill., *Phytolacca americana* L.<sup>33</sup>



Figure 4. *Glebinois coronaria* (L.)  
Cass. ex Spach



Figure 5. *Solanum elaeagnifolium* Cav.



Figure 6. *Allium neapolitanum*  
Cirillo

**Biomorphological and ecological analysis.** The life forms of plants show how they are adapted to their habitats. They are units of ecological classification of plants and characterize groups of plants that are divided into groups with common adaptive structures.

The analysis of life forms of the flora of Absheron according to the classification of I.G. Serebryakov (1962)<sup>34</sup> allowed us to identify 10 biomorphs, of which the largest number of species are herbaceous (87.3%), and the smallest - the share of a water-marsh plants (1.7%) (table 3)<sup>35</sup>.

According to the system of K. Raunkier<sup>36</sup>, the spectrum of life forms shows that in the studied flora the therophytes prevail,

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<sup>33</sup> Зернов, А.С., Мирозева, Ш.Н. Новые адвентивные виды цветковых растений во флоре Апшеронского полуострова // – Вак: АМЕА Botanika İnstitutu Elmi əsərləri, – с. 33. – 2013. – s.10-14.

<sup>34</sup> Серебряков, И.Г. Экологическая морфология растений. – М.: Высшая школа, – 1962. – 277 с.

<sup>35</sup> Мирозева, Ш.Н., Зейналзаде, Н.Ч. Классификация жизненных форм растений флоры Абшеронского полуострова по И. Г. Серебрякову. // Yaşıl dünya və insan sağlamlığı adlı Beynəlxalq Elmi-praktiki konfrans “Biomüxtəlifliyin dayaqçılığının təmin edilməsində yeni çağırışlar (COP29)”, – Naxçıvan: – 3-5 iyun, – 2024, – с. 61.

<sup>36</sup> Raunkier, K. The life forma of plant and statistical plant geography / K.Raunkier. – Oxford: Clarendon Press. – 1937. – 632 p.



numbering (348 taxa), the second place is occupied by hemicryptophytes (175), in third place are cryptophytes-geophytes (89), the smallest number of species are represented by phanerophytes (40), chamaephytes (47), cryptophytes-helophytes (12) and cryptophytes-hydrophytes (9) (figure 7).

Table 3

Spectrum of life forms according to I.G. Serebryakov

Life forms		Number of taxa	%
Wooden	trees	29	4
	shrubs	14	2
	bushes	11	1,5
	semi-shrubs	32	4,5
	semi-bushes	5	0,7
<b>Wooden in general</b>		<b>91</b>	<b>12,7</b>
Grassy	perennials	222	31
	biennials	26	3,6
	biannuals and annuals	40	5,6
	annuals	329	46
<b>Grassy in general</b>		<b>617</b>	<b>87,3</b>
water-marsh plants		12	1,7
<b>Total:</b>		<b>720</b>	<b>100</b>

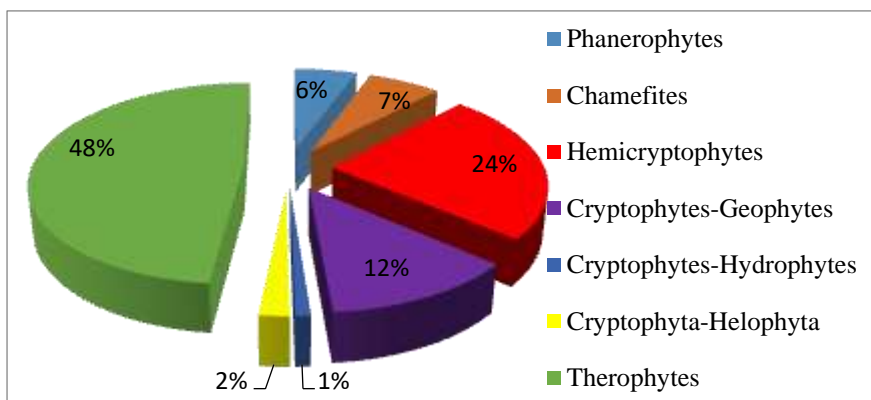


Figure 7. Spectrum of life forms according to C. Raunkier

We identified 9 ecological groups of plants in the surveyed flora in relation to water availability:

1. Xerophytes - 194 taxa (26.7%): *Stipa arabica* Trin. & Rupr., *S. capensis* (Thunb.) Röser & Hamasha, *Petrorhagia dubia* (Raf.) G.López & Romo, *Sterigmostemum incanum* M.Bieb., *Astragalus bakuensis* Bunge, *A. asterias* Steven, *Amberboa nana* (Boiss.) Iljin etc.;

2. Xeromesophytes - 220 taxa (30.6%): *Achillea micrantha* Willd., *Artemisia scoparia* Waldst. & Kit., *A. fragrans* Willd., *Schismus arabicus* Nees, *Linum corymbulosum* Rchb., *L. austriacum* L. etc.;

3. Mesoxerophytes - 20 taxa (2.8%): *Bromus squarrosus* L., *Cannabis sativa* L., *Medicago minima* (L.) L., *Rosa canina* Sm., *Tragopogon graminifolius* DC., *Convolvulus arvensis* L. etc.;

4. Mesophytes - 224 taxa (31.2%): *Asplenium ruta-muraria* L., *Oxalis corniculata* L., *Geranium rotundifolium* L., *G. molle* L., *Vicia sativa* L., *Euphorbia maculata* L., *Malva sylvestris* L., *Gentiana septemfida* Pall.<sup>37</sup>, *Bifora testiculata* Roth etc.;

5. Mesohydrophytes - 22 taxa (3.1%): *Geranium robertianum* L., *Potentilla reptans* L., *Sedum pallidum* M.Bieb., *Thlaspi arvense* L., *Echinochloa crus-galli* (L.) P.Beauv., *Atriplex aucheri* Moq etc.;

6. Hydrophytes - 25 taxa (3.5%): *Epilobium hirsutum* L., *Samolus valerandi* L., *Veronica anagallis-aquatica* L., *Ranunculus marginatus* d'Urv., *R. sceleratus* L., *Suaeda altissima* (L.) Pall., *S. prostrata* Pall. etc.;

7. Hydrophytes - 9 taxa (1.4%): *Ranunculus trichophyllus* Chaix, *Potamogeton pusillus* L., *Zannichellia pedunculata* Rchb., *Ruppia maritima* L., *Lemna minor* L., *Ceratophyllum demersum* L. etc.;

8. Obligate stem parasite, indifferent to soil moisture and light - 2 species (0.3%): *Cuscuta campestris* Yunck., *C. cesatiana*

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<sup>37</sup> Zeynalova, A., Distribution of Species of the *Gentiana* Genus in Azerbaijan / A. Zeynalova, P. Garakhani, A. Guseinova, Sh. Mirzayeva // Бюллетень науки и практики, – в. 9. – 2023. №12, – p. 97-101.

Bertol.

9. Obligate root parasite, indifferent to soil moisture and light - 4 species (0.4%): *Cistanche fissa* (C.A.Mey.) Beck, *Orobancha cernua* Loefl., *O. picridis* F.W.Schultz, *O. purpurea* Jacq.

In relation to light intensity in the flora of the Absheron Peninsula we have identified 3 groups of plants: heliophytes, sciophytes, hemigeliophytes (figure 8). The absolute majority of the overall flora of the study area (656 taxa) are heliophytes. A much smaller number of taxa (49) is represented by the group of hemigeliophytes, and the smallest (15) by the group of sciophytes, which are mainly forest communities of the Absheron Peninsula.

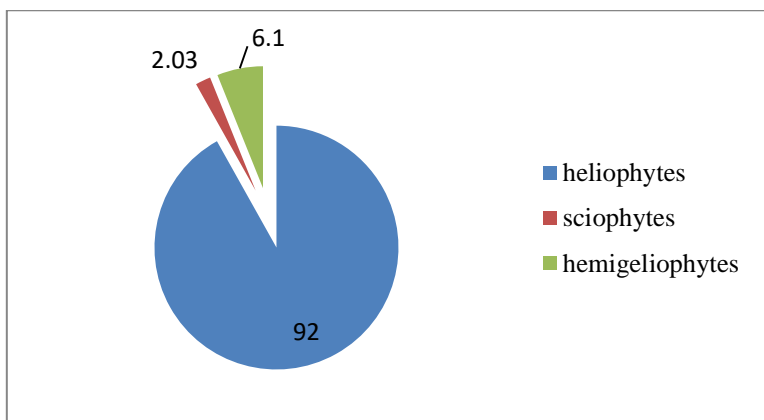


Figure 8. Correlation of ecological groups in relation to light: 1 - heliophytes; 2 - sciophytes; 3 - hemigeliophytes

**Analyzing endemism.** There are 50 (7%) endemic taxa belonging to 18 families distributed on the peninsula, of which 20 are endemics of Azerbaijan and 30 taxa are Caucasian endemics, indicating their presence in the wider Caucasus region (figure 9)<sup>38</sup>.

<sup>38</sup> Mirzəyeva, Ş.N. Abşeron yarımadasının Florasında yayılan lokal endemlər və onların qorunması // Azərbaycan Milli Elmlər Akademiyası Gənc Alim və Mütəxəssislər Şurasının təşkilatçılığı ilə keçirilən Akademik Elm Həftəsi, «AMEA-nın 70 illik yubileyinə həsr olunub», – Bakı, Azərbaycan: – 02 noyabr – 04 noyabr, – 2015, – s. 394.



Figure 9: Endemic species found on the Absheron peninsula (map)

Limiting factors for these plants are usually of anthropogenic nature. Technogenic pollution due to non-compliance with ISO environmental standards by industry, the range of the endemic species for Azerbaijan *Astragalus bakuensis* Bunge. (*Fabaceae* Juss.) is sharply decreasing, and *Ophrys mammosa* Desf. s.l. and *Iris acutiloba* C.A.Mey have become rare in Absheron. Due to quarrying, *Lasiopogon muscoides* (Desf.) DC. has declined to critical levels <sup>39</sup>.

To protect endemic plants (*Tulipa biflora* Pall., *Iris acutiloba* C. A. Mey., *Ophrys mammosa* Desf. s.l., *Gypsophila capitata* Bieb., *Ornithogalum sintensinii* Freyn., *Dianthus schemachensis* Schischk., *Astragalus pseudoutriger* Grossh.) of our flora and biodiversity in general, it is important to take serious measures to improve environmental literacy of the population and the involvement of local communities in environmental protection, systematize the treatment of soil and pastures, to manage construction in accordance with standards. The Protection of rare and endemic plants is also an important task for maintaining the sustainability of ecosystems. It requires the joint efforts of the scientific community, governments, non-governmental organizations and society as a whole.

**Analysis of synanthropic components.** Artificial ecotopes are created by man in place of natural phytocenoses destroyed for one reason or another. The artificial phytocenoses are the product of human labor, as well as the species composition of plants that humans introduce into artificial phytocenoses in the process of their creation <sup>40</sup>.

The share of synanthropic species in the Absheron flora is 44.4 % (319 species), they belong to 193 genera of 54 families. This group of plants consists of two florogenetic elements - aboriginal apophytic

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<sup>39</sup> Ali-zade, V.M., Salimov, R.A., Mirzayeva, Sh.N. Multidisciplinary approach studying populations of rare and threatened plant species in Azerbaijan // State of the World's Plants Symposium. KEW Royal Botanic Garden, – 25 may - 26 may, – 2017, – p. 29.

<sup>40</sup> Костин, А.Е., Авдеев, Ю.М. Геоботанические исследования биоразнообразия в урбанизированной среде // Вестник Красноярского государственного аграрного университета, – 2015. № 3. – с. 19–23.

(plants of the local flora, which have moved from the natural habitat to areas altered by human economic activity) and adventive. Among the most frequent synanthropic species of Absheron are the following (*Elytrigia repens* (L.) Nevski, *Taraxacum erythrospermum* Andr. ex Besser, *Cirsium arvense* (L.) Scop., *Capsella bursa-pastoris* Medik., *Stellaria media* (L.) Vill., *Artemisia fragrans* Willd., *Plantago major* L., *Urtica dioica* L., *Poa trivialis* L., *P. annua* L., *Chenopodium album* L., *Trifolium repens* L., *T. pratense* L., *Vicia villosa* subsp. *varia* (Host) Corb., *Ranunculus sceleratus* L., *Bromus squarrosus* L., *Geranium molle* L., *G. pusillum* L. etc.) apophytic taxa account for the majority - 84% (269 taxa), while adventive taxa account for much less - 16% (50 taxa). The total specific weight of 5 leading families (*Asteraceae* Giseke, *Poaceae* Barnhart, *Fabaceae* Juss., *Brassicaceae* Burnett, *Chenopodiaceae* Vent.) in the synanthropic flora was 50% (160 taxa), twelve leading genera - 70% (223 taxa), which exceeds the values of these indicators of the flora as a whole. The top 12 families contain 192 apophytic taxa (86% of overall apophytes) and 31 adventive taxa (14% of overall adventives) (figure 10).

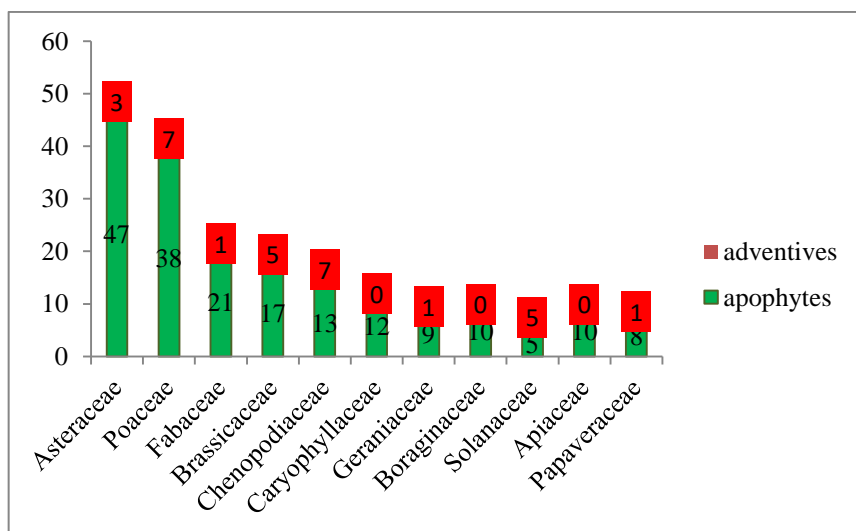


Figure 10. Leading families of synanthropic flora

Wastelands and roadsides are centers of conservation of high species richness in ruderal habitats. In general, in contrast to qualitative indices, quantitative indices of species richness of partial floras of ruderal habitats did not show significant differences. For example, when studying the partial flora of slot biotopes, typical (in decreasing order of frequency of occurrence) are: *Stellaria media* (L.) Vill., *Taraxacum erythrospermum* Andr. ex Besser, *Sagina procumbens* L., *Poa annua* L., *Plantago major* L., *Capsella bursa-pastoris* Medik., *Trifolium repens* L., *Chenopodium album* L., *Elytrigia repens* (L.) Nevski, *Artemisia verlotiorum* Lamotte, *Cirsium arvense* (L.) Scop., *Urtica dioica* L.; for lawns were found to be the most common *Stellaria media* (L.) Vill., *Sisymbrium irio* L., *Geranium molle* L., *Elytrigia repens* (L.) Nevski, *Taraxacum erythrospermum* Andr. ex Besser, *Cirsium arvense* (L.) Scop., *Poa trivialis* L.; conventional on urban railroad embankments *Taraxacum erythrospermum* Andr. ex Besser, *Cirsium arvense* (L.) Scop., *Elytrigia repens* (L.) Nevski, *Artemisia fragrans* Willd., *Veronica persica* Poir., *Holosteum umbellatum* L., *Lathyrus cicera* Hauman, *Phleum paniculatum* Huds., *Coryza canadensis* (L.) Cronquist etc.

Some interesting findings in the yards include: *Orchis simia* Lam., *Solanum elaeagnifolium* Cav., *Centaureum spicatum* (L.) Fritsch and ergasiophytes (wild introductions) – *Citrullus lanatus* (Thunb.) Matsum. & Nakai, *Glebionis coronaria* (L.) Cass. ex Spach, *Reseda lutea* L., *Viola odorata* L.

Halophytes form on highway roadside embankments due to salt used to melt ice and pollutants emitted by automobiles. In the conditions of Baku, Sumgayit and Khirdalan, these are, for example, *Alopecurus myosuroides* Huds., *Phragmites australis* (Cav.) Trin. ex Steud., *Lactuca tatarica* C.A.Mey., rarely *Juncus gerardii* Loisel. Wild from culture *Ailanthus altissima* (Mill.) Swingle, *Datura innoxia* Mill., *Allium neapolitanum* Cirillo, *Urtica urens* L., *Amaranthus caudatus* L. and other introducers are also found here<sup>41</sup>.

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<sup>41</sup> Мирзоева Ш.Н., Зернов А.С. Синантропные компоненты флоры Апшеронского полуострова // Бюллетень науки и практики. т. 10. № 6. 2024. – с. 52-57.

## CHAPTER V. VEGETATION OF THE ABSHERON PENINSULA

The modern vegetation of the Absheron Peninsula has been formed under the influence of natural and historical conditions since the Quaternary period. The structure and composition of phytocenoses in total areas of across the peninsula, from the Caspian Sea coast to the cities of Sumgayit and Khirdalan depend on relief, soil conditions, climate and other natural factors. Most plant communities is mainly confined are primarily confined to saline soils, gray, gray-brown, meadow-marsh and alluvial-meadow soil types, typical for semi-desert, desert and dry subtropical zones of the peninsula<sup>42</sup>.

The modern classification of vegetation of the peninsula was carried out using the approaches of L.I. Prilipko<sup>43</sup>, S.D. Agadjanov<sup>44</sup> et al, based on dominant-determinant classification. The most prominent and widespread natural phytocenoses were taken into account considered. According to this classification, we have the following vegetation units were identified the following vegetation units: vegetation type and subtype, formation class, formation group, formation, and association.

**1. Coastal desert-sand vegetation.** The vegetation of the coastal sand desert is very highly diverse, representing a unique ecosystem adapted to the extreme conditions of coastal and desert regions. Some typical species and features of such this vegetation are include halophytes, succulents, psammophytes, ephemerals and ephemerooids. Littoral vegetation is composed mainly of xerophytic shrubs, semi-shrubs, bushes, semi-bushes, and perennial, biennial, and annual variegated grasses, legumes, and cereals (figure 11). Edificators are usually members of the families *Chenopodiaceae*

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<sup>42</sup> Qurbanov, E.M., Axundova, A.A. Abşeron yarımadasının səhra bitkiliyi // – Bakı: Azərbaycan Botaniklər cəmiyyətinin elmi əsərləri, – c. 1. – 2010. – s. 95-99.

<sup>43</sup> Прилипко, Л.И. Растительный покров Азербайджана / Л.И. Прилипко. – Баку: ЭЛМ, – 1970. – 170 с.

<sup>44</sup> Агаджанов, С.Д. Флора и растительность приморских песков Азербайджана и их значение для закрепления и освоения песков: / Авторе канд.биол. наук. / – Баку, 1967. – 32 с.



Vent., *Poaceae* Barnhart and *Asteraceae* Giseke<sup>45</sup>. In this type of vegetation type, were identified 1 subtype (psammophyte-littoral desert), 1 formation class (psammophytic-littoral mixed herbaceous), 3 formation groups (*Artemiseta*, *Juncuseta*, *Tourniforteta*), 4 formations (*Artemisetum-Alhagosum*, *Juncuseta acutus* etc.) and 7 associations (*Artemisia arenaria* + *Alhagi pseudalhagi*, *Juncus acutus* + *Artemisia arenaria* etc.).



Figure 11. Seaside psammophytic herbaceous groups dominated by *Convolvulus persicus* L. and *Tournefortia sibirica* L.

**2. Saltwort-seaside-desert vegetation** is represented mainly by succulent xerophytes such as *Cakile euxinia*, *Suaeda prostrata*, *Salsola dendroides*, *Atriplex prostrata*. Most halophytes belong to the family Chenopodiaceae, but some species are included in the families *Cyperaceae*, *Poaceae*, *Plantaginaceae*, *Asteraceae*, *Brassicaceae*, *Tamaricaceae*, *Caryophyllaceae*, *Frankeniaceae* etc.<sup>46</sup>. In this

<sup>45</sup> Axundova, A.A. Abşeron yarımadasının bitki örtüyünün ekoloji-geobotaniki tədqiqatları və onların əhəmiyyəti // Azərbaycan Milli Elmlər Akademiyasının Botanika İnstitutunun elmi əsərləri, – Bakı: Elm, – c. 29. – 2009. – s. 145-149.

<sup>46</sup> Mirzayeva, Sh. N. Halophyte plants of the Absheron Peninsula // KARABAĞ 2. ULUSLARARASI UYGULAMALI BİLİMLER KONGRESİ "Zafer Günü və Şehitlerin Anısına", – Karabağ, Azərbaycan: AMİA, – 8 Kasım - 10 Kasım, 2021. – s. 347.

vegetation type were identified 1 subtype (saltwort desert), 2 formation classes (annual- saltwort desert, semi-shrubby, semi-shrubby with annual plants), 3 groups of formations (*Petrosimoneta*, *Salsoleta*, *Efemereta*), 4 formations (*Petrosimoneta brachiata*, *Salsoleta dendroides* etc.) and 6 associations (*Petrosimonia brachiata* + *Salicornia perennans*, *Salsola dendroides* + *Suaeda dendroides* + *Ephemerae* etc.).

3. **Semi-desert seaside vegetation** is characterized by a higher projective cover. As opposed to deserts, there are fewer haloxerophytic shrubs, semi-shrubs, bushes and semi-bushes. In this vegetation type were identified 1 subtype (seaside semi-desert), 1 formation class (semi-shrubby, semi-bushy, perennial herbaceous), 3 formation groups (saltworty with ephemera, *Artemisia* with the participation of saltworts and ephemerals, perennial herbaceous) 6 formations (*Halocnemeta strobilasei*, *Salsoleta nodulosa*, *Artemiseta fragrans*, *Alhageta pseudalhagi* etc.) and 9 associations (*Alhagi pseudalhagi*, *Artemisia fragrans* + *Halocnenum strobilaseum* + *Ephemerum*, *Salsola nodulosa* + *Ephemerae*, *Artemisia fragrans* + *Salsola ericoides*, *Artemisia fragrans* + *Salsola nodulosa* etc.).

4. **Seaside meadow vegetation.** In arid conditions, in particular in Absheron, such a subtype as known as hollow-meadow is formed. Hollow-meadow ecosystems are usually characterized by high biodiversity, here it is significantly different from semi-desert and desert vegetation in terms of species composition and abundance. As, in these phytocenoses due to more favorable conditions mesophytes prevail. In this vegetation type were identified 1 subtype (hollow-meadow), 2 formation classes (perennial herbaceous- cereal hollow-meadow, semi-shrubby hollow- meadowy), 3 formation groups (*Cynodoneta*, *Alhageta*, *Salsoleta*) 3 formations (*Cynodoneta dactylon*, *Alhageta pseudoalhagi*, *Salsoleta dendroides*) and 4 associations (*Cynodon dactylon* + *Artemisia szowitsisana* + *Alhagi pseudoalhagi*, *Ephemerae* + *Alhagi pseudoalhagi*, *Salsola dendroides* + *Aeluropus lagopoides* + *Tamarix ramosissima*, *Salsola dendroides* + *Aeluropus littoralis*).

5. **Water-marsh vegetation** is distributed over a more limited area than other phytocenoses on the peninsula (figure 12). The marked

water-marsh phytocenoses are mainly found on meadow-marsh and wet sandy soils around lakes, in places of groundwater outlets. On oil polluted gray-brown soils, there are *Salsola dendroides* + *Aeluropus lagopoides* + *Tamarix ramosissima* associations, characteristic of wetland vegetation.

Within this vegetation we found 21 species of aquatic plants and identified 1 subtype (marshy meadow), 2 formation classes (perennial cereal marshy meadow and shrubby perennial cereal marshy meadow), 1 formation group (*Phragmiteta*), 1 formation (*Phragmiteta australis*) and 4 associations (*Phragmites australis* + *Carex divisa*, *Phragmites australis* + *Typha domingensis*, *Phragmites australis* + *Tamarix ramosissima* + *Carex divulsa*, *Phragmites australis* + *Tamarix hohenackeri* + *Juncus littoralis*).



Figure 12. Water-marsh vegetation with participation of *Ranunculus trichophyllus* and *Carex divulsa*

The results of the research and literature <sup>47</sup> review are as follows, 4 vegetation types, 5 subtypes, 8 formation classes, 12 formation groups, 17 formations and 30 associations were identified in the composition of the vegetation cover of the Absheron Peninsula.

## CHAPTER VI. RARE SPECIES OF THE FLORA OF THE ABSHERON PENINSULA

Based on literature data (Red Book of the Republic of Azerbaijan, 2023) it can be said that there are 35 (3.6%) rare and endangered plant species in the flora of the Absheron Peninsula. Of these, 8 species belong to CR category, 10 species belong to VU category, 12 species belong to EN category, NT, DD and NE categories respectively, 1 species each and two taxa are pink-listed.

There are rare and unique plants that do not grow in any other region of the Caucasus, are found only in the flora of Absheron and can be considered a treasure of the peninsula.

Certain criteria should be applied to assess species for protection as objectively as possible. Narrow range, including local endemism of the species, threat of habitat destruction: high economic or recreational pressure on habitats, uncontrolled economic use of the species (for medicinal, food, fodder, technical or ornamental purposes) are examples. Some species for one reason or another can be said to have disappeared in Absheron: *Lasiopogon muscoides* (Desf.) DC., *Linaria corrugata* Karjag., *Linaria albifrons* Spreng., *Anabasis salsa* (C.A. Mey.) Bnth., *Anogramma leptophylla* (L.) Link., *Ammochloa palestina* Boiss., *Eversmannia subspinosa* (DC.) B.Fedtsch., *Stipa pellita* (Trin. et Rupr.) Tzvel., *S. capensis* Thunb., *Avena ventricosa* Balansa., *Trisetaria linearis* Forssk., *Puccinellia poecilantha* (K.Koch)

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<sup>47</sup> Гусейнова, Х.З. Классификация полупустынной и пустынной растительности прибрежной полосы Каспийского моря (в пределах Азербайджана) // - Нижневартовск: Бюллетень науки и практики, - 2021. т. 7. №11, с. 49-54.

Grossh., *Bothriochloa ischaemum* (L.) Keng., *Artemisia szovitsiana* (Bess.) Grossh., *Taraxacum desertorum* Schischk., *Tragopogon brevirostris* DC., *Astragalus caucasicus* (Pall.) Podlech., *Onobrychis vaginalis* C.A. Mey., *Linum spicatum* L., *Gagea commutata* K. Koch., *Centaurea caspia* Grossh., *Chorispora iberica* (M. Bieb.) DC., *Thesium maritimum* C.A. Mey., *Th. szowitsii* A.DC., *Teucrium canum* Fisch. & Mey. Old herbarium specimens of the above species are stored in the Herbarium Department of the Institute of Botany of the MSE of the Republic of Azerbaijan. Repeated expedition trips to the distribution sites indicated on herbarium labels failed to find these species.

## CONCLUSIONS

1. A complete flora of Absheron, consisting of 720 taxa (11.3% of the flora of the Caucasus and 14.5% of the flora of Azerbaijan), belonging to 396 genera and 85 families, the leading among them are with *Poaceae* (94 taxa), *Asteraceae* (85), *Fabaceae* (60), *Astragalus* L. (14) and *Suaeda* Forssk. ex J.F.Gmel. (10) being the leading ones. Of the total number of taxa, 656 (91%) are represented by native taxa, 319 (44%) by synanthropic taxa, and 64 (9%) by adventive taxa. However, these rates cannot be considered constant, as the adventitious flora of any region is influenced by invasive and introduced species.
2. For the first time in Absheron 3 new species for the flora of the Caucasus have been discovered (*Glebionis coronaria* (L.) Cass. ex Spach., *Solanum elaeagnifolium* Cav. и *Allium neapolitanum* Cirillo.), 3 new species for the flora of the South Caucasus (*Lepidium didymum* L., *Fumaria capreolata* L. и *Lemna gibba* L.), and 4 new species for the flora of Azerbaijan (*Rumex marschallianus* Rchb., *Cuscuta campestris* Yunck., *Ruta graveolens* L. и *Mentha spicata* L.). New habitats have been identified for 45 species in Apsheron (*Carex divulsa* Stokes., *Geranium albanum* M. Bieb., *Zannichellia pedunculata* Rchb., *Cannabis sativa* L., *Sedum*

*pallidum* M.Bieb., *Orchis simia* Lam., *Rosa canina* L. *Sagina procumbens* L. etc.).

3. The taxonomic spectrum of the flora of Absheron is generally typical of the Mediterranean, Mediterranean-Iranian-Turanian, European and Caucasian elements (112, 95, 88 and 65 taxa, respectively).
4. In the studied flora, 10 biomorphs were identified according to the classification of I.G. Serebryakov, of which herbaceous plants prevail (617 taxa), the least represented are woody forms (91 taxa) and water-marsh plants (12 taxa). According to the system of K. Raunkier, there are 7 biomorphs, of which the majority are therophytes (348) and hemicryptophytes (175), the smallest number are phanerophytes, chamaephytes (40 and 47 each), cryptophyte-helophytes (12) and cryptophyte-hydrophytes (9). The dominant ecological groups are mesophytes and xeromesophytes, (224 and 220 taxa), and xerophytes (194).
5. The vegetation cover of the study region is represented by 4 types and 5 subtypes of vegetation, 8 formation classes, 13 formation groups, 18 formations and 30 associations.
6. Endemics constitute 7% of the total flora of Absheron (50 taxa), and 20 (40%) of them are endemics of Azerbaijan (*Acantholimon schemachense*, *Calligonum bakuense*, *Astragalus bakuensis*, *A. caspius*, *Dianthus schemachensis*, *Iris acutiloba*, *Linaria corrugata* etc.), and 35 are rare and endangered species included in the Red Book of the Republic of Azerbaijan (2023).

## PRACTICAL RECOMMENDATIONS

Observation of the biodiversity of ruderal biotopes has shown that a number of measures have to be taken to maintain the ecological condition of these biotopes. In particular, it is necessary to reclaim ruderal biotopes:

1. Restore the eroded surface layer of affected habitats; remove landfills; treat roadside and railroad habitats with herbicides;

- and monitor habitat biodiversity to identify new adventive plants and prevent the spread of invasive species.
2. Create a regional Black Book of flora and take specific measures to prevent the introduction of alien species into the region's vegetation cover. This effort should involve administrative bodies, ecological and communal services, and the Ministry of Agriculture of the Republic of Azerbaijan.
  3. To protect and increase the number of rare species, conduct regular monitoring of existing populations and search for new locations of these species.
  4. Fence off areas on beaches where rare species grow, and install posters with photos and brief information about these red-book species, as well as prohibiting their collection.
  5. Develop a scientific action plan to prevent desertification of the Absheron Peninsula.

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The defense will be held on 27 September 2024 at 11<sup>00</sup> at the meeting of the Dissertation Council ED 1.26 of the Supreme Attestation Commission under the President of the Republic of Azerbaijan, operating at the basis of the Institute of Botany of the Ministry of Science and Education of the Republic of Azerbaijan.

Address: AZ 1004, Baku city, A. Abbaszadeh St., crossing 1128.

Dissertation is accessible at the library of the Institute of Botany of the Ministry of Science and Education of the Republic of Azerbaijan.

Electronic versions of the thesis and abstract are available on the official website of the Institute of Botany of the Ministry of Science and Education of the Republic of Azerbaijan.

Abstract was sent to the required addresses on 23 August 2024.

Signed for printing: 20.08.2024

Paper size: A5

Amount: 38925

Circulation: 20